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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/831,508	05/10/2001	Nobuki Matsui	819-540	5656

7590 03/23/2005

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EXAMINER	
DUONG, THANH P	

ART UNIT	PAPER NUMBER
1764	

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/831,508	MATSUI ET AL.	
	Examiner	Art Unit	
	Tom P Duong	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Responsive to the request for reconsideration filed on February 16, 2005 has been reviewed. The final office action mailed November 17, 2004 is withdrawn and the statutory period set therein vacated. A new office action on the merits/follows.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

1. Claims 1, 3-4, 6-9, and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Lahn (5,160,456). Lahn discloses a hydrogen gas generator (Col. 3,

lines 7-10 and Col. 6, lines 18-21) for generating hydrogen from a family, oxygen, and steam, source fuel of the hydrocarbon (Col. 3, lines 40-44) said hydrogen gas generator comprising a fuel reformer (ATR: steam reforming/POx) with a catalyst (page 17, claim 13) which exhibits an activity to a partial oxidation reaction (Col. 6, line 3) of said source fuel; wherein said source fuel, oxygen, and steam are supplied to said reformer (ATR) so that said partial oxidation reaction (POx) occurs on said catalyst (Col. 6, lines 10-21) and a water gas shift reaction (Col. 1, lines 45-50) occurs in which CO produced in said partial oxidation reaction is a reactant, wherein H2O/C ratio is less than 0.5 (Col. 6, lines 4-6); wherein the O2/C ratio is 0.9 times of O2/C theoretical or O2/C is not more than 1.5 times of O2/C theoretical (Col. 6, lines 6-8); and an active site of catalyst formed of rhodium and ruthenium (Group VIII, Col. 4, lines 29-30).

2. Claims 1-5, 11, 13, and 17 are rejected under 35 U.S.C. 102(e) as being anticipated by Clawson et al. (6,641,625). Regarding claim 1, Clawson discloses a hydrogen gas generator (Fig. 2) for generating hydrogen from a family, oxygen, and steam, source fuel of the hydrocarbon (Col. 3, lines 28-36) said hydrogen gas generator comprising a fuel reformer (ATR and Col. 3, lines 53-56) with a catalyst (Col. 12, lines 5-10) which exhibits an activity to a partial oxidation reaction of said source fuel; wherein said source fuel, oxygen, and steam are supplied to said reformer (ATR) so that said partial oxidation reaction (POx) occurs on said catalyst and a water gas shift reaction (Col. 4, lines 7-10) occurs in which CO produced in said partial oxidation reaction is a reactant. Regarding claim 2, Clawson discloses the water gas shift reaction is

controlled such that the CO2/CO ratio, which is the ratio of CO2 to CO in an outlet gas of said fuel reformer (Fig. 2), is not less than 0.2 (Col. 4, lines 45-49). Regarding claims 3-4, Clawson discloses the supply rate of source fuel and steam to said fuel reformer is set such that the H2O/C ratio (S/C), which is the ratio of the number of moles of said steam to the number of moles of carbon of said source fuel, is not less than 0.5 or not more than 3.0 (Col. 31, lines 65-67). Regarding claim 5, Clawson discloses the hydrogen gas generator with outlet gas temperature of said fuel reformer (ATR) is not more than 800 degrees centigrade (Col. 21, lines 15-20 and Col. 22, lines 1-2). Regarding claim 11, Clawson discloses the use of catalysts is formed of at least rhodium and ruthenium (Col. 12, lines 1-9). Regarding claim 13, Clawson discloses a fuel cell capable of generating electricity by making use of hydrogen fuel (Col. 1, lines 48-52). Regarding claim 17, Clawson discloses air supply means for supplying air to fuel cell (Fig. 26).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Clawson '625 in view of Lahn et al. (5,160,456). Regarding claims 6 and 8, Clawson discloses proper control of air/fuel (Col. 19, lines 48-55) but fails to disclose the ratio of the number of moles of said oxygen to the number of moles of carbon of said source fuel less than 0.9 times the O2/C theoretical mixture ratio in said partial oxidation reaction, and the O2/C ratio is not more than 1.5 times O2/C theoretical mixture ratio. Lahn '456 teaches the oxygen and alkane feed molar ratio is about 0.2 to 1.0 and the O2 is added to provide the sensible heat for reactants and to maintain the overall reaction temperature at a desired level in the reaction zone (Col. 6, lines 3-15). Thus, it would have been obvious in view of Lahn to one having ordinary skill in the art to modify the control system of Clawson with proper O2/C ratio as taught by Lahn in order to maintain the desired operating temperature in the reformer. Regarding claim 7, Lahn teaches the O2/alkane feed ratio is 0.2 to 1.0 and the O2/CH4 is 0.5 to 1.0 in the POx {CH4 +1/2O2 = CO +2H2}. In order to complete the conversion of methane gas to synthesis gas in the POx, it is obvious in view of Lahn that Lawson '625 has a ratio of the number of moles of oxygen to the number of moles of carbon of said source fuel greater than said O2/C theoretical mixture ratio in the Pox or at most thru routine optimization. Claim 9 recites limitations similar to claims 6 and 3, above; thus, claim 9 is rejected for the same reasons as applied to claims 6 and 3. Regarding claim 10, Clawson '625 discloses a hydrogen gas generator (Fig. 2) for generating hydrogen from a source fuel of the hydrocarbon family, oxygen, and steam, said hydrogen gas generator comprising: a fuel reformer (ATR and Col. 3, lines 53-56) with a catalyst (Col. 12, lines 5-10) which exhibits an activity to a partial oxidation reaction (POx) of said

source fuel, and the H2O/C ratio (S/C), which is the ratio of the number of moles of said steam to the number of said source fuel carbon moles, is not less than 0.5 but not more than 3 (Col. 31, lines 65-67) whereby said partial oxidation reaction occurs on said catalyst and a water gas shift reaction (shift reactor) occurs in which CO produced in said partial oxidation reaction is a reactant; wherein said water gas shift reaction controlled such that the CO2/CO ratio, which is the ratio of CO2 to CO in an outlet gas of said fuel reformer (ATR), is not less than 0.2 (Col. 4, lines 45-49) and wherein the temperature of said outlet gas of said fuel reformer (ATR) is not more than 800° C (Col. 21, lines 15-20 and Col. 22, lines 1-2). Clawson '625 discloses proper control of air/fuel (Col. 19, lines 48-55) but fails to disclose the ratio of the number of moles of said oxygen to the number of moles of carbon of said source fuel less than 0.9 times the O2/C theoretical mixture ratio in said partial oxidation reaction, and the O2/C ratio is not more than 1.5 times O2/C theoretical mixture ratio. Lahn '456 teaches the oxygen and alkane feed molar ratio is about 0.2 to 1.0 and the O2 is added to provide the sensible heat for reactants and to maintain the overall reaction temperature at a desired level in the reaction zone (Col. 6, lines 3-15). Thus, it would have been obvious in view of Lahn to one having ordinary skill in the art to modify the control system of Clawson with proper O2/C ratio as taught by Lahn in order to maintain the desired operating temperature in the reformer.

4. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Clawson '625 as applied in claim 11 and further in view Madgavkar et al. (4,186,801). Clawson fails to disclose the catalyst is supported on a honeycomb monolith carrier. Madgavkar teaches oxidation catalyst is carried on by an inert support structure such as a honeycomb monolith carrier and such structure provides the benefits of supporting the catalyst and minimizes the pressure drop across the bed (Col. 5, lines 35-54). Thus, it would have been obvious in view of Madgavkar to one having ordinary skill in the art to modify the hydrogen gas generator of Clawson '625 with a catalyst of honeycomb monolith carrier as taught by Madgavkar in order to gain the above benefits.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson '625 as applied in claims 1-12, above and further in view of Negishi (6,165,633). Regarding claim 14, Clawson '625 fails to disclose a discharged gas supply means (35) for supplying a steam-containing gas, discharged from an oxygen electrode of said fuel cell, to said fuel reformer (5) for a supply of steam to said fuel reformer (5). Negishi teaches the oxidizing exhaust gas (via 73) from the oxygen electrode is recycled to the air tank 36 then to a reformer 22 to maximize the utilization of the fuel (Col. 15 lines 4-5). Thus, it would have been obvious in view of Negishi to one having ordinary skill in the art to modify the hydrogen gas generator of Clawson '625 with oxidizing exhaust gas stream 73 as taught by Negishi in order to maximize the utilization of the fuel.

6. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Clawson '625 in view of Harashima (5,290,641). Regarding claim 15, Clawson fails to

disclose output current control means (38) for controlling the output current said fuel cell so that the oxygen concentration and the steam concentration of a discharged gas that is supplied to said fuel reformer (5) fall within their respective given ranges. Harashima teaches the control system 5, which measures the output current from the power inverter system 4 and compares the output current with the reference point, and then sends the correct current signal to adjust the flow rate of G1, G2, G3, and A to minimize the load fluctuation (Col. 1, lines 53-67 and Col. 2, lines 1-30). Thus, it would have been obvious in view of Harashima to one having ordinary skill in the art to modify the device of Clawson with control means as taught by Harashima in order to minimize load fluctuation in the fuel cell power supply. Regarding claim 16, Clawson fails to disclose the output current control means for controlling the output current of said fuel cell so that the coefficient of utilization of oxygen of said fuel cell ranges from 0.4 to 0.75. Harashima teaches the control system 5 with sensor to detect output current from power inverting system 4 and compares the output current with the reference current, and then adjusts the oxygen (air flow rate A) to the fuel cell (Col. 1, lines 53-67 and Col. 2, lines 1-30). Such output current control means provides the benefit of minimizing load fluctuation in the fuel cell power supply. Thus, it would have been obvious in view of Harashima to one having ordinary skill in the art to modify the device of Clawson with output current control means as taught by Harashima to minimize load fluctuation in the fuel cell power supply. Although, Clawson fails to disclose the coefficient of oxygen of fuel cell ranges from 0.4 to 0.75; however, Clawson in view of Harashima appears to provide a control system that optimizes the utilization of oxygen in the fuel cell and it

would have been obvious to obtain such coefficient values thru fine tuning of the control elements. Also, adjusting the output current control means to obtain an optimum operating conditions would have been considered a result effective variable by one having ordinary skill in the at the time the invention was made (See *In re Boesch*, 617 F.2d.272,205 USPQ 215 (CCPA 1980)) and (See *In re Aller*, 105 USPQ 223).

Response to Arguments

Applicant's arguments with respect to claims 1-17 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tom P Duong whose telephone number is (571) 272-2794. The examiner can normally be reached on 8:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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March 7, 2005
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